Proterosaurus is classed under the Rhynchocephalia, apparently on the author's judgment, though the proposition might be hard to sustain. There are chapters given to Anomodonts, Crocodiles, newly-discovered Dinosaurs, and ancient birds; in which curious illustrations appear, some of the funniest being reproductions of the animals created by Mr. Waterhouse Hawkins for the Central Park, New York. The concluding chapters describe and illustrate mammals. *Palæotherium* and *Coryphodon*, *Dinotherium* and *Mastodon*, are fairly well illustrated. Horses and their ancestors give illustrations of *Phenacodus* and *Hyracotherium*. There is some account of the extinct marsupials of Australia, and of the extinct mammals of South America, such as *Toxodon*, *Macrauchenia*, and *Machærodus*.

The *Bos urus* of Cæsar, which probably became extinct in Britain before the Roman occupation, is represented by a spirited drawing. Appendices give a table of strata, an enumeration of the orders of animals, and a list of books for reference. H. G. S.

ERNEST MALLARD.

THE following paragraphs are extracted from an obituary notice of this distinguished mineralogist, contributed to the *Mineralogical Magazine* by M. G. Wyrouboff:—

In the history of scientific mineralogy the name of M. Mallard will undoubtedly occupy a place beside that of Haüy, to whom is universally conceded the honour of originating this branch of human knowledge. It may be asserted without exaggeration that M. Mallard created anew the science of crystallised bodies by bringing that science into close and intimate union with general physics. Only a few years ago mineralogy was regarded as a purely descriptive science, and crystallography was no more than a special chapter of abstract geometry.

He was a close follower of Bravais, whose beautiful theory he, to his great credit, adopted, developed, and popularised. Bravais, however, viewed the problem of crystalline structure as a geometrician, and saw only one side of the question. His conception of the lattice is based upon the homogeneity of the crystal; now, experience had long ago shown that crystals are far from being always homogeneous. To M. Mallard is due the honour of explaining this apparent contradiction by demonstrating, theoretically and experimentally, that crystals frequently consist of several lattices distributed in a certain regular manner about an axis which does not belong to any one of them.

M. Mallard did more than this, and hereon rests his claim to imperishable fame: he deduced from the theory of lattices and of reticular assemblages all the physical phenomena observed in crystallised bodies, including what were called the optical anomalies. Owing to his labours crystallography became a completely rational science to the same extent as any other branch of physics.

The crowning work of M. Mallard was his "Traité de Cristallographie," which was intended to comprise three volumes. Two only of these have been published; the third was to have dealt with crystalline assemblages, polymorphism and isomorphism, the most complex problems in crystallography, and those in which his most original work was done. The materials from which this volume was to be constructed are to be found in the memoirs published by M. Mallard since 1879. Some of these are real masterpieces, and have become classical; such are the papers on optical anomalies, on the quasi-cubic form of all crystallised bodies, on the transformations of polymorphous substances, and on isomorphous mixtures.

When we add to these the many detailed researches which he published in the *Bulletin* of the French Mineralogical Society, some relating to improved instruments of precision, and some to particular mineral species such as boleite, lussatite, tridymite, and melanophlogite, we cannot but feel that since the time of Haüy no one has done so much to advance that section of physical science which is concerned with crystallised bodies.

NOTES.

M. COTTEAU, whose death we announced last week, has bequeathed his fine collection of living Echinoderms to the Paris Muséum d'Histoire Naturelle.

REUTER reports that an earthquake shock of short duration was felt at Athens at a quarter to eight on the morning of the 26th inst., and also at Corinth, Vastizza, Zante, Thebes, Chalcis, and Atalanti.

IT is announced that a laboratory for the manufacture of tuberculin, mallein, anthrax, vaccine, &c., will shortly be established in Rome in connection with the laboratories of Hygiene of the Ministry of the Interior.

WE learn that Prof. Pettenkofer has resigned the chair of hygiene and the directorship of the Hygienic Institute in the University of Munich, on account of his advanced age. He is succeeded by Prof. Hans Buchner.

THE *British Medical Journal* says that the President of Queen's College, Belfast, has received information that the Government will grant the sum of £2,500 for the erection and equipment of a physiological and pathological laboratory. Plans are being prepared, and the buildings will be at once proceeded with.

MR. H. C. RUSSELL, of Sydney Observatory, writing to us with reference to an aurora observed on July 20, says that he noticed that while the display lasted there was a fog or haze over the southern sky bright enough to hide 5th magnitude stars, and when these began to reappear the auroral light vanished, as if the fog or haze had been necessary for its manifestation.

MR. RICHARD LANGDON, station-master at the Silverton Station of the Great Western Railway, Devon, died on July 18. Nearly thirty years ago he began to study astronomy, in which he took an absorbing interest to the end of his life. Being a skilful mechanician, and having acquired a knowledge of optics, he employed his spare time in constructing an eight-inch silver-on-glass equatorial reflector, grinding the mirror with a machine which he made for the purpose. He was a keen and accurate observer, and in 1872 he read a paper "On certain Markings on the Planet Venus" before the Royal Astronomical Society.

FOR just a year the Birahi Ganga River has been dammed back by the great landslip at Gohna. We noted this event shortly after its occurrence, and on July 5 gave an abstract of Mr. T. H. Holland's report upon it. In this report Mr. Holland estimated that the lake would overflow the barrier about the middle of August. The news has now come that the water reached the top of the dam early on Sunday morning, and cut through the temporary dam which had been constructed to prevent its escaping during the night. Combined percolation and overflow caused the water to fall rapidly, until its length was reduced from five miles to about two and a half miles. Telegraphing on Monday, Reuter's correspondent at Simla says that the water thus released has swept away all the Government buildings on the banks of the river. At Hardwar a torrent of water 6ft. in depth rushed through the town, but there was no loss of life, owing to the precautions taken. All the buildings, however, between Gohna and Hurdwar have been destroyed. The lake formed by the landslip is now empty. Though considerable damage has been done to property by the escape of the water, no loss of human life is reported. The Indian Government is to be commended for the ample precautions taken to avert disaster at the time of overflow, and for the scientific manner in which the formation of the lake has been investigated.

THE journey to Greenland, modestly referred to by Prof. G. F. Wright in our correspondence columns on July 12, promises to lead to results of scientific value. We understand that the excursion was organised by Dr. Frederick A. Cook, anthropologist of Peary's first expedition, and consists of fifty persons, of whom a good part are students of science. Among the scientific members are Prof. W. H. Brewer, of Yale College, Prof. B. C. Jillson, of Pittsburg, Pa., who with Prof. G. F. Wright and his son, of Oberlin, Ohio, and a party of six, will disembark in Umenak Fiord about latitude 71°, to study the border of the ice-sheet, the neighbouring glacial deposits, the glaciers entering the fiord, the Tertiary deposits of the vicinity, and make a collection of the plants and animals. Prof. L. L. Dyche, at the head of the department of zoology and taxidermy at the State University of Kansas, is the official naturalist of the expedition. He will make a point of collecting birds and mammals. With him are Mr. S. P. Orth and Mr. B. F. Stanton (both of Oberlin), as assistant naturalists, to make general collections. Mr. E. A. McIlhenney, of Louisiana, accompanies the expedition as an ornithologist. Prof. C. E. Hite, of Philadelphia, with three assistants, goes to Labrador for general exploration. Prof. E. P. Lyon, of Chicago, goes for the general study of biology. The expedition expects to return about September 20.

PROF. H. B. DIXON's report on the explosion that occurred at the Albion Colliery, near Pontypridd, South Wales, at the end of last June, has been published as a Parliamentary paper. Although it was not possible to examine all the workings, the evidence obtained justifies the opinion that the explosion throughout its main extent was purely a dust explosion. Prof. Dixon thinks it would have been practically impossible for fire-damp to have accumulated in the main intake air-roads, or to have been introduced suddenly into them in sufficient quantity to feed an explosion throughout the extent of road actually traversed by the flame. On the other hand, sufficient dust was found lying in a dry and fine state along the main roads to feed the flame throughout the parts penetrated by the explosion. As to the origin of the explosion, the belief is expressed that a dynamite shot raised a cloud of inflammable particles and set them on fire. If precautions were taken always to water the dust near the spot where a cartridge is going to be fired, such explosions as that at the Albion Colliery would be less frequent.

THE twenty-third meeting of the French Association for the Advancement of Science was held at Caen, from August 9 to 15, under the presidency of M. Mascart. In his opening address, the president paid homage to the many men of light and leading who were born and nurtured in the little province of Normandy, in which the meeting was held. Pierre Varignon, the celebrated geometer, was born at Caen in 1654. The two chemists, Rouelle and Vauquelin, and the intrepid traveller Dumont-Durville, were born in the same neighbourhood. Other names associated with the province are the great astronomer Laplace; Elie de Beaumont, one of the founders of French geology; Augustin Fresnel, whose work in physical optics has become classical; and that intellectual giant, Le Verrier. The second section of M. Mascart's address was devoted to brief descriptions of some of the institutions designed for scientific study in the United States. Praise was especially given to the generous donors whose lavish benefactions had helped on the cause of science in America. If M. Mascart had followed the traditions attached to a president's office, he would have given his audience his reflections upon the progress accomplished in the branch of knowledge to which he has paid most attention, that is, meteorology. This, however, he did not do, but passed in review some points in the history of electricity. The meeting was not favoured with fine weather, nevertheless the number of members was about the same as in previous years. The total receipts amounted to 91,182 francs, of which, however, only 55,551 francs came from annual subscriptions. The sum of 15,624 francs was disbursed in grants for scientific research. The Association will meet next year at Bordeaux, and in 1896 the place of meeting will be Tunis.

THE *London Gazette* for Friday last contains the following new denominations of standards for electrical measurement, adopted by the Privy Council on the previous day: (1) *Standard of Electrical Resistance.* The standard of electrical resistance, denominated one ohm, being the resistance between the copper terminals of the instrument marked "Board of Trade Ohm Standard Verified 1894" to the passage of an unvarying electrical current, when the coil of insulated wire forming part of the aforesaid instrument, and connected to the aforesaid terminals, is in all parts at a temperature of 15°·4 C. (2) *Standard of Electrical Current.* A standard of electrical current, denominated one ampere, being the current which is passing in and through the coils of wire forming part of the instrument marked "Board of Trade Ampere Standard Verified 1894," when, on reversing the current in the fixed coils, the change in the forces acting upon the suspended coil in its sighted position, is exactly balanced by the force exerted by gravity in Westminster upon the iridio-platinum weight, marked A, and forming part of the said instrument. (3) *Standard of Electrical Pressure.* A standard of electrical pressure, denominated one volt, being one-hundredth part of the pressure which, when applied between the terminals forming part of the instrument marked "Board of Trade Volt Standard Verified 1894," causes that rotation of the suspended portion of the instrument which is exactly measured by the coincidence of the sighting wire with the image of the fiducial mark A, before and after application of the pressure, and with that of the fiducial mark B during the application of the pressure, these images being produced by the suspended mirror, and observed by means of the eye-piece. In the use of the above standards the limits of accuracy attainable are as follows:—For the ohm, within one-hundredth part of one per cent.; for the ampere, within one-tenth part of one per cent.; for the volt, within one-tenth part of one per cent. The coils and instruments referred to are deposited at the Board of Trade Standardising Laboratory, 8 Richmond-terrace, Whitehall, London.

THE Department of Science and Art has issued the following list of candidates successful in this year's competition for the Whitworth Scholarships and Exhibitions. Scholarships of the value of £125 per annum (tenable for three years)—John Ball, 22, engineer, Derby; James H. Smith, 23, student, Manchester; Harry Verney, 24, fitter, Bristol; Charles F. Smith, 21, mechanical engineer, Bristol. Exhibitions of the value of £50 (tenable for one year)—Frank Fisher, 19, engineer, Brighton; William M. Thornton, 24, student, Liverpool; John W. Hinchley, 23, student, Lincoln; William D. Young, 23, engineer, Westfield (N.B.); Alexander L. Mellanby, 22, engineer, West Hartlepool; William T. F. Trunchion, 22, fitter, Bedford; Henry Deanesly, 25, draughtsman, Wincanton;

William T. Swinger, 19, engineer apprentice, Plumstead, Kent; Arthur W. Ashton, 21, fitter, Plumstead, Kent; Arthur E. Mascall, 18, engineer, Woolwich; William Rosbotham, 25, student Belfast; Joseph J. Kirwin, 20, engine fitter apprentice, Devonport; Charlie W. Cairns, 21, apprentice engineer, Newcastle-on-Tyne; John W. Button, 23, fitter, Oldham; Sydney Eraut, 22, mechanical engineer, London; Charles E. Pickles, 18, student, Bradford; Richard G. Allen, 21, fitter apprentice, Southsea; Alexander Craig, 22, engineer, Crewe; Thomas S. Usherwood, 20, engineer apprentice, London; Walter Eraut, 19, mechanical engineer apprentice, London; Lewis E. Limming, 21, shipwright apprentice, Southsea; Sidney E. Lamb, 20, fitter apprentice, Devonport; Francis J. Russell, 20, fitter apprentice, Portsmouth; Edgar R. Sutcliffe, 19, draughtsman, Leeds; George F. Hambly, 20, engineer apprentice, London; William Gore, 23, engineer, King's Lynn; Thomas S. Cockrill, 25, marine engineer, London; William H. James, 21, engineering student, Cardiff; Harry J. Peachey, 18, engineer apprentice, Stratford (London); James N. Boot, 25, engineer, London.

DURING a severe hailstorm at Vicksburg, in May last, a remarkably large hailstone was found to have a solid nucleus, consisting of a piece of alabaster from one-half to three-quarters of an inch. During the same storm at Bovina, eight miles east of Vicksburg, a gopher turtle, six by eight inches, and entirely encased in ice, fell with the hail. Commenting upon this, in the *Monthly Weather Review*, Prof. Cleveland Abbe says that apparently some special local whirls or gusts carried the enclosed objects from the earth's surface up to the cloud region, where they were encased by successive layers of snow and ice, until they fell as hailstones. He points out that the fact that hailstones, as well as drops of water and flakes of snow, often contain nuclei that must have been carried up from the earth's surface, is entirely in accord with the general principle that ascending currents precede the formation of cloud and rain, and that solid nuclei are needed to initiate the ordinary precipitation of moisture.

DR. HERGESELL has sent us the results of the meteorological observations made in Alsace and Lorraine during the year 1892, containing hourly values for Strassburg, and monthly and yearly summaries at various other stations. The results obtained from two anemometers at the central station are very interesting; one of the instruments is erected at about 170 feet, and the other at about 470 feet above the ground. The wind velocity at the higher level has a daily range corresponding exactly with that of mountain stations, the minimum occurring in the morning, and the maximum during the night. The results show that the indications of an anemometer fixed more than 150 feet above the ground are much more comparable than those at a lower level, where the indications are affected by local conditions. We look forward to the promised publication in the next volume of a chart showing the distribution of rainfall for a long series of years.

WE have received from M. E. Durand-Gréville two pamphlets entitled "Les grains et les orages," in which the author has endeavoured to show the connection between certain squalls, which accompany large barometric depressions, and thunderstorms. It is generally admitted that important thunderstorms occur at the same time on different points of an isochronous line moving towards east-north-east. Before the storm there is a gradual fall of the barometer, a rapid rise during the storm, and a sudden change in the direction of wind. But opinions differ considerably as to the conditions under which the thunderstorms occur. The author has investigated certain special cases, and has endeavoured, with some success, to co-ordinate the various views. He shows that several of them, while contradictory, at least in appearance, are capable of reconciliation, and are founded upon facts, which have been diversely interpreted. The papers are accompanied by several explanatory diagrams showing the line taken by the squalls, and the various forms of the isobaric curves which accompany them.

IN an interesting report issued by the United States Department of Agriculture, Mr. Alexander McAdie gives an account of the statistics concerning the position, &c., of buildings struck by lightning, and also of the best methods to be employed to protect buildings, &c., from being damaged by lightning. One interesting point which is very prominently brought out by the statistics is the decreased liability to accident from lightning strokes in thickly populated districts. In fact, it may be said that, in general, the risk in the country is five times as great as in a city. The report concludes with a number of rules which ought to be observed with reference to lightning, from which we may select the following:—If the conductor, at any part of its path, goes near water or gas mains, it is best to connect them to it. Independent grounds are better than connection to water or gas-pipes. Clusters of points or groups of two or three along the ridge of the roof are recommended. The top of the rod should be plated, or in some way protected from rust, and chain or linked conductors are of little or no use. Finally, if you should be in the vicinity of a person who has just been struck by lightning, no matter if the person struck appears to be dead, go to work at once and try to restore consciousness. There are many cases on record proving the wisdom of this course, and there is reason for believing that lightning often brings about suspended animation rather than somatic death. Try to stimulate the respiration and circulation, and do not cease in the effort to restore animation for less than an hour's time.

AT a recent meeting of the Vienna Academy of Science, Herr Bruno Piesch gave an account of his recent work on the change in the electrical resistance of aqueous solutions, and of the electric polarisation with change of pressure. The author has examined a large number of liquids, both acids and salt solutions. The apparatus was so arranged that the resistance and polarisation would be simultaneously measured. The high pressures used were obtained by means of a Cailletet's compression apparatus, and experiments were carried on up to a pressure of 600 atmospheres. The vessel in which the liquid to be experimented upon was placed was enclosed in the iron receptacle of the pump, being insulated by means of an ebonite plug. The following results have been obtained:—A change in pressure is always accompanied by a change in the electrical resistance, the resistance decreasing with increase of pressure. No definite connection is observable between the amount of the pressure change and the concentrate of the solution, but in the case of most of the substances investigated the change was greater in the case of very dilute solutions than in more concentrated ones. The magnitude of the change in resistance with change in pressure is very small, as is also the case with the change in the polarisation. In most cases an increase of the polarisation with increase of pressure was observed, but the irregularities were in this case greater than those observed in the resistance measurements. In conclusion the author examined a solution of ammonium nitrate in alcohol, when he obtained changes in the same sense as in the case of aqueous solutions.

AT the same meeting, Herr J. Liznar read a paper on the 26-day period of the earth's magnetism. In a previous communication the author had compared the diurnal variation a stations in middle and high latitudes. In the present paper the magnitude of the 26-day period variation for declination and inclination at the stations of Pulowsk and Jan Mayen are compared, and it is shown that the amplitude of the variation at the northern station is four times as great as at the southern. The author also considers that the small variations which constitute the 26-day period variation are not due to a direct magnetic action of the sun, but that they must have their origin in some secondary action of the same.

In cases where it is desired to investigate a ray of light reflected perpendicularly from a surface, it is usual to employ a transparent plate of glass which transmits the incident ray before it falls upon the surface, and partially reflects it aside on its return. Such an arrangement, best known in Gauss's eye-piece, may be called a Gauss's plate. The best position of such a plate is, as pointed out by Herr B. Walter in the current number of *Wiedemann's Annalen*, not the commonly accepted one of 45°, but another depending upon the refractive index of the material of the plate, and upon whether the light is polarised and in what manner. From theoretical considerations, he concludes that for light polarised either in or at right angles to the plane of incidence the greatest possible intensity of the reflected light is 15 per cent. of the original intensity, whatever may be the refractive index. If the light is polarised in the plane of incidence, the plate must be placed at a lesser angle to the ray the smaller the index of refraction. For light polarised at right angles to this plane the reverse holds good. But for refractive indices about 1·4 this angle reaches the common value of 7° 46′ 16″. The best position for ordinary light may be determined by regarding it as composed of the two species of polarised light. For crown glass the inclination should be 10½°, at which position the intensity of the reflected light is 2·84 times that obtained with the usual inclination of 45°.

A NEW automatic sounding instrument has lately been brought into use by Captain G. Rung, the director of the Copenhagen Meteorological Institute, under the name of the universal bathometer. Unlike the instruments hitherto constructed, which register the depth attained by the compression undergone by a column of air, Captain Rung's bathometer, as described in *Hansa*, measures the density of a small volume of the compressed air cut off at the bottom of the sea. This density is directly proportional to the depth attained, and is measured by allowing the compressed air to expand until it is under atmospheric pressure only. Its volume will then be proportional to the density it had reached during compression. The whole apparatus is very neat and compact. A metallic tube contains two other tubes side by side, both communicating with a small chamber at the top. A valve shuts off the communication with the one or the other of the tubes, accordingly as the sounder is being lowered or raised. When the bathometer is being let down, water enters the "air tube" from the bottom, and compresses the air in the tube and in the small chamber. The whole is enclosed in another heavy tube, in which it can slide a little up and down. When the bathometer touches the bottom, the inner tube slides down, thereby turning the valve so as to close the communication with the air tube and open to the "measuring tube." At the same time, a couple of spring catches prevent the inner tube sliding up again. The bathometer is then drawn up to the surface, and the reading on the measuring tube at once indicates the depth. This tube is made of glass, and is graduated in fathoms or other units of length at equal intervals. This constitutes the chief advantage of this over previous types. In instruments measuring the depth by the volume of the compressed air the graduations had to be at smaller and smaller intervals as the depth increased, since the amount of compression decreases at high pressures. Captain Rung's instrument, on the other hand, can be graduated directly up to any limit of depth which it is likely to attain.

MR. W. J. MOENKHAUS has lately studied a species of American freshwater Percidæ—*Etheostoma caprodes*, Rafinesque—with a view to ascertain the extent of its variation, the relation of its variation to its geographical distribution, the extent of variation in each locality, and the variation with age. He gives an account of his investigation in the *American Naturalist* for August, and from it we learn, among other points, that the difference between specimens from the same locality is very slight. The greatest variation was found to be in the colour-patterns of the fish, but the most complicated colour-pattern can be connected with the simplest by means of intermediate stages. These variations, however, could not be connected with the latitudes inhabited by the different varieties. Slight variations were found in proportions and number of fin rays.

THE Plankton Expedition has yielded some very interesting results with regard to the bacteriology of the ocean, which are now published by Dr. B. Fischer in "Die Bakterien des Meeres nach den Untersuchungen der Plankton-Expedition." Except at very great depths, germs capable of germination were found everywhere. The number in the Canary, Florida, and Labrador currents was larger than in the south equatorial, north equatorial, and Guinea currents. None could be detected with certainty in the bed of the ocean; but bacteria abound at a depth of 400 m., and are certainly present at depths between 800 m. and 1100 m. The prevailing form of microbe is the spiral; but bacterium forms are also frequent; micrococci are rare. Forms more or less resembling the cholera-vibrio, both in their form and in their mode of motion, were very common. Most marine bacteria are aerobic, but some appear to be also facultatively anaerobic. Not a few form pigments, and a large number are luminous in the dark; the phosphorescent forms were most commonly met with on the surface of living fish. A number of new species are described.

SOME interesting points await settlement in the natural history of the mollusk *Gundlachia*, whose shell presents such puzzling and anomalous features. In a recently published paper on the Australasian forms (*Proc. Linn. Soc. N.S.W.* viii. 1893), Mr. Charles Hedley briefly reviews our knowledge of the genus and its distribution, and gives descriptions and figures of *G. petterdi* and *G. beddomei*. In the case of the former species, he describes a series of young shells showing the method by which the primary *Ancylus*-like shell is transformed into the curious double shell of the adult. Stimpson's suggestion that the septum which partially closes the aperture of the primary shell should be compared physiologically with the epiphragm of the Helices—as a protection during hibernation—well deserves some attempt at verification; as also does the unproved impression that under particular conditions the shell of *Gundlachia* never attains its normally double form, but remains simple and patelliform throughout life.

THE July number of *Modern Medicine and Bacteriological Review* contains an article entitled "The Value of Prof. Koch's Discovery," in which it is mentioned that the State of New York has recently passed a law authorising the use of tuberculin as a means of determining the presence or non-presence of the tuberculous process in cows. It is pointed out that though Koch's tuberculin has not fulfilled the expectations raised for it as a curative agent, as a means of diagnosis it may be of great service. Two or three drops of tuberculin injected beneath the skin of a cow will, if the animal is tuberculous, give rise within a few hours to an elevation of temperature of several degrees, whilst this characteristic reaction is absent in the case of animals free from this disease. Amongst the bacteriological notes is one on soap as a germicide, from which it appears that the so-called antiseptic soaps containing salicylic acid or carbolic acid, yield no better results than ordinary toilet soap, the latter destroying the cholera bacillus in from ten to fifteen minutes when applied in the proportion of 2·5 parts of soap to 1000 parts of water. The same journal contains an account of an electric-light bath, consisting of a small cabinet large enough to permit of one person sitting comfortably, the walls of which are completely covered with mirror-glass. From forty to fifty electric lights are so distributed that every part of the body of the "bather" is almost equally exposed to the light. Dr. Gebbardt, who communicates the article, reserves his opinion as to the curative merits of this novel bath, but mentions that the intense light, contrary to his anticipations, did not produce an unpleasant or exciting effect, but exercised a calming influence upon him. Like the ordinary vapour bath, the electric light bath is followed by the application of cold water.

Part v., completing the fifth volume of the *Transactions*, has been issued by the Norfolk and Norwich Naturalists' Society, which fully maintains the interesting character of its publications. The first paper consists of the annual "Presidential Address," in which the President (Mr. Thomas Southwell) avails himself of the twenty-fifth anniversary of the formation of the Society to give a slight sketch of its history and the work it has accomplished; and we cannot but congratulate the members on the excellent results it has to show, the five thick volumes forming not only an epitome of the natural history of the county for the past twenty-five years, with excellent lists of the fauna and flora, but numerous biographical sketches are given, often with portraits, of the men whose labours in the past have proved so valuable to their successors. The address then gives some very interesting information as to the physical features of the county in times past, as well as of its natural productions. The establishment of a branch of the Society at Great Yarmouth called for a second "address," which is devoted to an account of the local naturalists, collectors, and gunners, for which, ever since the latter part of the last century, that favoured locality has always been celebrated, as well as to the enumeration of the many ornithological rarities which have there been obtained. Prof. Newton contributes a very interesting account of the great flood in South-West Norfolk in 1852–53, which resulted in the temporary return to the fens in that district of birds, such as the black tern and black-headed gull, which had long ceased to frequent the locality. The occurrence of the bearded seal on the Norfolk Coast, for the first time in Great Britain, is announced. Mr. Stacy-Watson has a very useful paper on the varieties and distribution of the herring. There are also papers on the local occurrence of fungi and flint implements, with lists of Norfolk earthworms, ichneumons, mammalia, fishes, birds, hemispheræ, and flowering plants. Of the twenty papers in the number before us there are only two which have not a strictly local bearing.

The last number of the *Izvestia* of the Russian Geographical Society contains two papers which are sure to be welcome to geographers. The first, by G. I. Tanfilieff, is on the tundras of North-East Russia, on the shores of the Arctic Ocean, between the rivers Mezen and Pechora. Middendorff's descriptions of the tundras of northern East Siberia are classical for the subject. So are also Beketoff's "Flora of Arkhangelsk" and his additions to the Russian translation of Griesebach's work. But so much has lately been written about the tundras and the features they have in common with the steppes, that the necessity of new researches in this direction was very much felt. M. Tanfilieff fully confirms this view, and shows the further likeness which exists between the black-earth, the clay, and the sandy steppes on the one side, and the peat-bog, the clay, and the sandy tundras on the other. And he gives, moreover, a very vivid description of the inner processes of the life of the tundra, and enters into very interesting considerations relative to the extension of the ever-frozen soil, and the limits put by it to the northward spreading of forests. The southern limits of the former, and the northern limits of the forest region, are identical, and wherever there are in the tundra islands of ground which does not freeze, groves of fir-trees appear upon them; while even in the forest tracts the appearance of peat-bog islands, which remain frozen to a great depth, is always followed by a disappearance of the trees. The rivers act as drainage channels, which prevent water from percolating the soil, and therefore prevent it from freezing; this is why their courses are always followed by trees, which penetrate into the treeless tundras along the watercourses. The author's remarks on the Samoyedes and the reindeer are also very valuable. He fully confirms the excellent reputation of these children of the tundra, who, in consequence of the extremely slow growth of the reindeer lichen (*Cladonia rangifera*) are deprived of their pasture grounds, and reduced to complete ruin, by the Zyryanes and the Russians, who bring their herds of over 2000 head of reindeer into the Samoyede domains.

The other paper, also of great interest, is by V. M. Obrucheff, on the orography of the Nang Shan. The Russian geologist has crossed this system of mountains both in the west of Lake Kuku-nor, at the western end of these highlands, and in the east of the lake; and, with the information previously gathered by Przewalsky and Potanin, he was enabled to draw a scheme map of the whole system, appended to the *Izvestia*. It appears that the highlands of Nang Shan consist of a series of parallel ridges running west-north-west to east-south-east, both in the north and in the south of Kuku-nor. The first chain is the Lung-thu-shan, in the north-east of the towns Su-choi and Han-chou. Then comes the Richthoffen ridge, continued in the east by the Momo-shan; then comes Humboldt's ridge, which is supposed by the author to have its continuation in the Maling-shan, while Ritter's ridge is continued east-south-eastwards by the Tsing-shi-ling. However, some doubt still prevails as to these last two points, on account of a want of exploration in the middle part of the highlands. The chain which rises just on the southern coast of Lake Kuku-nor (South Kuku-nor chain of Przewalsky) is continued towards west-north-west by a ridge, to which M. Obrucheff gives the name of Mushketoff's ridge, while the last chain of the group is named Semenoff's ridge. This classification brings some order, which was most desirable, into this grand group of mountains. Their geological history and later dislocations are also discussed in the same paper.

A recently published *Bulletin* of the U.S. Fish Commission (vol. xi., 1891) contains the results of a search for a fish-hatching station in the Gulf States. The character of the biological station which the United States Government desired to establish is indicated in the following extract from the instructions to Prof. Evermann: "To unite in one station the facilities for fish-cultural work with the salt-water species, for the pond culture of fresh-water species, for the investigation and development of methods for the propagation and rearing of the oyster, and for the investigation of the marine life of this coast. This means, of course, a laboratory of marine biological research, not large or expensive, but thoroughly equipped in all respects for its work." The explorations led to the conclusion that no point on the coast examined offered entirely satisfactory conditions for the establishment of a combined fresh and salt water station, though a site near Galveston presented some advantages. In addition to the reports prepared by Prof. Evermann, the volume referred to above contains reports n matters connected with his investigations. Such, for instance, is a statistical report on the fisheries of the Gulf States, by Mr. J. W. Collins and Dr. H. M. Smith; a report on a collection of fishes from the Albemarle region of North Carolina, by the latter author; a paper on the spawning habits of the shad, by Mr. S. G. Worth; a report on the aquatic invertebrate fauna of the Yellowstone National Park, and of the Flathead region of Montana, by Prof. S. A. Forbes; and a report on the fisheries of the South Atlantic States. Finally, the volume contains a description, by Mr. Bashford Dean, of the methods of oyster-culture in Italy, Spain and Portugal, Germany, Holland, Belgium, and England. Oyster-culture, as practised in France, had previously been reported upon in connection with the U.S. Fish Commission. This article, like most of the others, is excellently illustrated. They all help to disclose the possibilities of fish industries in the United States, and indicate how "the harvest of the sea" may be increased in value.

We have received a ponderous volume (vol. vi.) of the transactions of the Reale Accademia delle Scienze Fisiche e Mathematiche, Naples. The volume contains nineteen fine plates and eighteen papers, most of which refer to natural science subjects.

Mr. Rowland Ward, the well-known taxidermist, has published the seventh edition of his "Sportsman's Handbook," containing information on the "practical collecting, preserving, and artistic setting-up of trophies and specimens, to which is added a synoptical guide to the hunting grounds of the world."

The second volume of Priestley's "Experiments and Observations on Different Kinds of Air"—that is to say, the one in which he first gave an account of the discovery of oxygen in 1775—is reproduced in the seventh number of the handy "Alembic Club Reprints," published by Mr. W. F. Clay, Edinburgh. The next volume in this series will contain Scheele's work in connection with the discovery of oxygen.

The Robert Boyle lecture, delivered by Lord Kelvin before the Oxford University Junior Scientific Club, in May last, on "The Molecular Tactics of a Crystal," has been published by the Clarendon Press. No student of crystallography should neglect to read the lecture, for in it the geometry of crystalline structure is dealt with in the simplest manner. The substance of the lecture is contained in a paper read by Lord Kelvin before the Royal Society on January 18, and reprinted in these columns on March 8.

Messrs. George Philip and Son have lately published a book, of fifty pages, entitled "Knowledge through the Eye," by Mr. A. P. Wire and Mr. G. Day. The authors explain how to use the optical lantern in illustrating lectures in science and other branches of knowledge, and describe a new method of preparing lantern slides without the use of a camera. A drawing of the required illustration is first made. A piece of specially prepared transparent paper (sold by Messrs. Philip) is then placed over it, and the drawing is transferred by tracing. A lantern slide is obtained by making a contact exposure in the ordinary manner, using the picture on the transparent paper as a negative. This method, however, has very little to commend it. Line drawings are easily made upon a plate of smoked or varnished glass, or upon glass having a thin film of collodion upon it; and as the illustrations have to be drawn in any case, it is just as well to do the work directly as to make a lantern slide of a tracing made from a drawing in the way described by the authors.

The additions to the Zoological Society's Gardens during the past week include a Hairy Armadillo (*Dasypus villosus*) from South America, presented by Mr. George Simpson; a —— Bamboo Rat (*Rhizomys*, sp. inc.) from India, presented by Mr. Angus M. Kinloch; a Himalayan Monaul (*Lophophorus impeyanus*) from the Himalayas, presented by Captain H. R. H. Helpman; two Sharp-nosed Crocodiles (*Crocodilus acutus*) from Jamaica, presented by Dr. Poole; two Common Chameleons (*Chamæleon vulgaris*) from North Africa, presented by Mr. E. Palmer; two Smooth Snakes (*Coronella lævis*) from Hampshire, presented by Mr. E. Penton; two Common Vipers (*Vipera berus*), British, presented by Mr. Hugh Bromley; a Sykes's Monkey (*Cercopithecus albigularis*) from East Africa; two Heloderms (*Helodermæ suspectum*) from Arizona, deposited; three Blood-breasted Pigeons (*Phlogænas cruentata*) from the Philippine Islands, purchased; a Yak (*Pæphagus grunniens*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

Solar Eclipse Photography.—Mr. Albert Taylor recently read a paper before the Royal Dublin Society, on the selection of suitable instruments for photographing the solar corona during total solar eclipses. The photographs obtained by other observers and himself during the total eclipse of April 1893, have indicated the best methods, both photographic and instrumental, to be adopted for the next observable total solar eclipse, on August 8, 1896. One of the most disputed points in eclipse photography, says Mr. Taylor, refers to the proper exposure required to obtain the faint extensions of the corona without fogging the plate by the sunlight. Two opposite opinions are held as to the best method of photographing these diaphanous coronal extensions. Short exposures and slight photographic action are believed by some observers to give the best results, but others hold that long exposures and great photographic action are necessary to attain the desired end. An examination of the photographs obtained during the eclipse of April 1893, shows that the latter view must be abandoned; and that nothing is to be gained by using photographic actions exceeding 15 or 16. Photographic action is determined by the formula $100 \frac{a^2}{f^2} t. s.$, where a is the aperture of the instrument employed, f the focal length, t the time of exposure, and s the sensitiveness of the plate. For obtaining photographs showing the detailed structure of the inner and middle coronæ, short exposures and a long-focus object-glass are recommended. The opinion is expressed that, with a twelve-inch object-glass of between forty and sixty feet focus, one hundred seconds' exposure would give nearly all the corona that is within reach of the photographic method of attack in the present state of photography. It is believed that with an instrument having a focal length equal to ten times the aperture, all the external corona would be obtained in about fifteen or sixteen seconds.

Observations of Saturn and Uranus.—Since the beginning of this year Prof. E. E. Barnard has used the 36-inch of the Lick Observatory in some observations of Saturn and Uranus (*Astronomy and Astro-Physics*, August). Measurements of the former planet were undertaken with a view of determining whether the ball was situated in the exact centre of the rings. Between the end of the ring and the limb on the following side of Saturn the angular distance was $11''\cdot287$, while similar measures on the preceding side gave $11''\cdot167$. The difference is less than one second of arc, and it may very well be due to some peculiarity in the measures. It is certainly not sufficient as yet to suggest that the planet is not exactly at the centre of its rings. Prof. Barnard has also made a series of measures of the polar and equatorial diameters of Uranus, and a series of measures of the position angles of the equator. From these it appears that "the equator of the planet coincides with the planes of the orbits of the satellites, thus verifying the supposition that Uranus rotates on an axis deviating but little from the plane of its orbit."

BIOLOGY AT THE BRITISH ASSOCIATION.

SECTION D, in spite of the loss of Physiology, had so many papers that it was necessary to meet on most days under the two departments of Zoology and Botany. A noteworthy feature was the large number of papers by distinguished foreigners, and the theoretical nature of a large proportion of the communications.